Steam Heated (Pregelatinized) Milo For Fattening Beef Calves

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Since milo is the chief feed grain for fattening cattle in the Southwest, methods of improving its nutritive value are of major concern. With fattening cattle, fully 75% of the total feed cost is represented by cost of grain alone. Hence, it is of prime importance to determine the best method of preparation of a grain such as milo. Small increases in efficiency of using grain in a fattening ration can greatly improve profits.

Traditionally, cattle feeders have considered milo (grain sorghum) to be only about 90% the value of corn. More recent research, which is discussed elsewhere in this publication, suggests that in certain types of rations, milo has less feeding value than barley.

One of the reasons that milo may be of less energy value to the ruminant is that the dense and compact kernel, with its outer layer of flinty starch, is less subject to methods of processing, or to bacterial and other digestive enzymes in the paunch and small intestine.

If so, one possibility for improving milo might be to increase the availability of its starch to rumen micro-organisms or digestive enzymes. A method was studied involving the steam heating of ground milo until it was almost completely gelatinized, i.e., the envelope containing the starch granules (which may constitute 65% or so of the grain) was broken down to permit easy access to enzymes and more rapid digestion. Attempts to improve milo with steam heat by passing it through the chamber of a pelleting mill were reported in 1962[1]

Procedure

Through the cooperation of Grain Products, Inc., Dodge City, Kansas, it was possible to obtain two differently processed grain sorghums. One was in the ground, but otherwise natural state, while the other had been passed through a special tube or steam chamber and heated to such a degree that it was almost completely gelatinized. A maximum temperature of approximately 270° F was achieved by steam heat and mechanical extrusion through the dies to form the expanded pellets. Actual cooking time in the 180-270° F range was estimated to be about 10 seconds. In addition to gelatinization of starch, considerable denaturation of protein and possible alteration of fat may have occurred. This "expanded" milo came out in small, hard cubes and was re-ground to the same physical state as the ground, but untreated, milo.

Two lots, each containing 12 light, weaner, Hereford steer calves, were selected from the Experiment Station herd and self-fed rations containing the differently processed grains.

[1] See Okla. Agr. Expt. Sta. Mis. Pub. MP-67, p. 113.

Initially, the ration contained (%): ground milo, 56; wheat bran, 7.5; cottonseed meal, 3.7; urea, 0.8; trace mineralized salt, .75; dicalcium phosphate, .75; molasses, 5.3 and cottonseed hulls, 25.

At the mid-point of the trial, the rations were modified slightly and made to contain (%) ground milo, 55; cottonseed meal, 9; dehydrated alfalfa meal, 5; urea, 1; molasses, 3; cottonseed hulls, 26; calcium carbonate and salt, each 0.5. Vitamin A was added to both rations to supply at least 3,000 I.U./cwt., and an antibiotic was added during the first 60 days of the trial. A free-choice mineral mix of 2 parts salt and one part steamed bone meal was available to both lots.

Initial and final shrunk weights (16 hours off feed and water) were recorded, as well as 28-day intermediate weights. Following the completion of the 127-day feeding trial, the calves were reversed to the opposite ration for about 10 days to study their pattern of feed intake on the opposite milo treatment.

Data were obtained from two rumen-fistulated steers fed the normal or treated milo rations as described for the group-fed calves during the last part of the feeding trial. Collections of rumen ingesta and fluid were made twice on each steer while on each ration. Through the cooperation with the Dairy Department, analyses were made for volatile fatty acids and pH of the rumen fluid.

Results

Chemical composition of rations fed and results of the 127-day feeding trial are summarized in Table 1. Calves fed the steam-heated milo gained less than those fed the untreated milo. A marked difference was apparent in feed intake, with the ration containing the cooked milo consumed at much lower levels than that containing untreated milo. However, feed efficiency was only slightly different for the two rations.

The cause of this depression in feed intake, and the slower rate of gain which resulted, poses an interesting problem. It is unlikely that it was caused by changes in odor and flavor resulting from the cooking process, and both grains were fed in the same particle size. More likely a faster rate of fermentation or output of acid from in the rumen of calves fed the gelatinized milo may have adversely affected feed intake. Preliminary results on volatile fatty acid production in the rumen showed no consistent pattern between the untreated milo and the gelatinized milo rations. It was noted that calves of Lot 1 consumed 1.6 lb. less per head per day of the cooked milo ration when the treatments were reversed during a 10-day period following the feeding trial.

These results do not support research at Maryland and elsewhere that steam-heating grain corn improves rate and efficiency of grain. Possibly, grains differ in response to steam heating due to the nature and chemistry of the starch they contain.

Table 1.—Effect of Steam Heated (Gelatinized) Milo for Fattening Beef Calves

Lot Number and Milo Treatment	Lot 1 Normal Ground Milo	Lot 2 Pregelatinized Ground Milo
No. steers per lot*	12	12
Av. weights, lb.		
Initial	497	459
Final	870	776
Total gain—127 days	373	317
Av. daily gain, lb.	2.46	2.25
Av. daily feed intake, lb.	16.84	15.33
Feed required per cwt. gain, lb.	685	681
Chemical composition of ration, % as fed		
Dry matter	91.46	91.83
Ash	3.27	3.78
Crude protein	14.43	14.60
Ether extract	3.01	1.53
Crude fiber	11.96	12.54
N-free extract	58.79	59.38

* One steer removed for respiratory infection in Lot 1 early in the trial and is not included in data. One steer in Lot 2 bloated severely during last 28-day period and data during this period is not included.

Summary

Steam-heating ground milo, so as to gelatinize its starch, resulted in lowered feed intake and reduced daily gains of calves self-fed rations containing 55% of the treated grain. Feed efficiency was not greatly affected by heat treatment. Complete degradation of starch in the milo kernel does not appear to improve its feeding value for fattening cattle.